NEW PRIMATE FOSSILS FROM COLHUEHUAPIAN DEPOSITS AT GAIMAN AND SACANANA, CHUBUT PROVINCE, ARGENTINA.

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RESUMEN: NUEVOS PRIMATES FOSILES DE DEPOSITOS COLHUEHUAPENSES DE GAIMAN Y SACANANA, PROVINCIA DE CHUBUT, ARGENTINA. – En 1983 una expedición paleontológica del MACN colectó un nuevo primate fósil de las localidades colhuehuapenses de Gaiman y Sacanana, Chubut, Argentina. Los nuevas especímenes son los primeros primates recolectados en dichas localidades en los últimos cuarenta años. Los fósiles de Sacanana se asignan provisionalmente a *Tremacebus harringtoni* y los de Gaiman a *Dolichocebus gaimanensis*. Por su morfología dental ambos taxa son muy primitivos comparados con los platirrinos existentes, y los huevos restos dentales de Gaiman corresponden muy aproximadamente al hipotético ancestro de los platirrinos sugerido por los análisis comparativos de los monos vivientes del Nuevo Mundo. Las similitudes dentarias entre cf. *Dolichocebus* y los antropoides del Oligoceno de Egipto avalan la teoría del origen africano de los monos platirrinos.

ABSTRACT: In 1983 a paleontological expedition from the MACN collected new primate fossils from the Colhuehuapian localities of Gaiman and Sacanana in Chubut, Argentina. The new specimens are the first primates recovered from these localities in over forty years. The Sacanana fossils are provisionally assigned to *Tremacebus harringtoni* and the Gaiman specimens are provisionally assigned to *Dolichocebus gaimanensis*. In dental morphology, both taxa are very primitive compared with extant platyrrhines and the new dental remains from Gaiman correspond very closely to the hypothetical ancestral platyrrhine suggested by comparative analysis of living New World monkeys. Dental similarities between *cf. Dolichocebus* and Oligocene anthropoids from Egypt support an African origin for platyrrhine monkeys.

INTRODUCTION

Fossil platyrrhine monkeys are extremely rare. The fossil record of this very diverse group of living Neotropical mammals consists of less than a dozen species ranging in age from Deseadan through Recent (Fig 1). The earliest fossil New World monkey is *Branisella boliviana* from the Deseadan of the Salla-Luribay Basin in Bolivia (Hoffstetter, 1969; Rosenberger, 1981; Wolff, 1984). In Argentina, there are two fossil monkeys known from Colhuehuapian localities in Chubut - *Dolichocebus gaimanensis* from Gaiman (Bordas, 1941; Kraglievich, 1951) and *Tremacebus harringtoni* from Sacanana (Rusconi, 1935; Hershkovitz, 1974). *Homunculus* is known from numerous Santacrucian localities in the Province of Santa Cruz (e.g. Ameghino, 1891; Bluntschli, 1931) and also from Colhuehuapian levels at the Great Barranca (Hershkovitz, 1981). There are three fossil monkey species from the late Miocene sediments at La Venta, Colombia – *Neosaimiri fieldsi, Cebupithecia sarmientoi,* and *Stirtonia tatacoensis* (Stirton and Savage, 1951; Stirton, 1951; Hershkovitz, 1970), and two species from Recent cave deposits in the Carribean – *Xenothrix mcgregori* and *"Saimiri" bernensis* (Williams and Koopman, 1952; Rimoli, 1977; MacPhee and Woods, 1982). Of these fossils, only the late Miocene species from Colombia can be clearly linked with living subfamilies; the affinities of the remaining taxa are the source of considerable debate, much of which results from the small number and fragmentary condition of the available specimens.

In order to expand our knowledge of fossil platyrrhines, the M.A.C.N. (Buenos Aires) sponsored paleontological expeditions to the late Oligocene (Colhuehuapian) localities of Gaiman and Sacanana in Chubut Province (Fig. 2) during January and February of 1983. Among the many vertebrate fossils found during this work were seven primate fossils, five isolated teeth and a talus from Gaiman, and a partial mandible from Sacanana. These were the first primates recovered from these localities in over forty years. The purpose of this paper is to provide descriptions and photos of the new finds together with a brief discussion of their implications for our understanding of platyrrhine evolution (see also Fleagle and Bown, 1983). More detailed descriptions of both the fossils and the localities are available elsewhere (Fleagle and Bown, 1983· Bown and Soria, In Prep.).

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FIG. 1: Map of Central and South America showing localities from which fossil primates have been recovered.

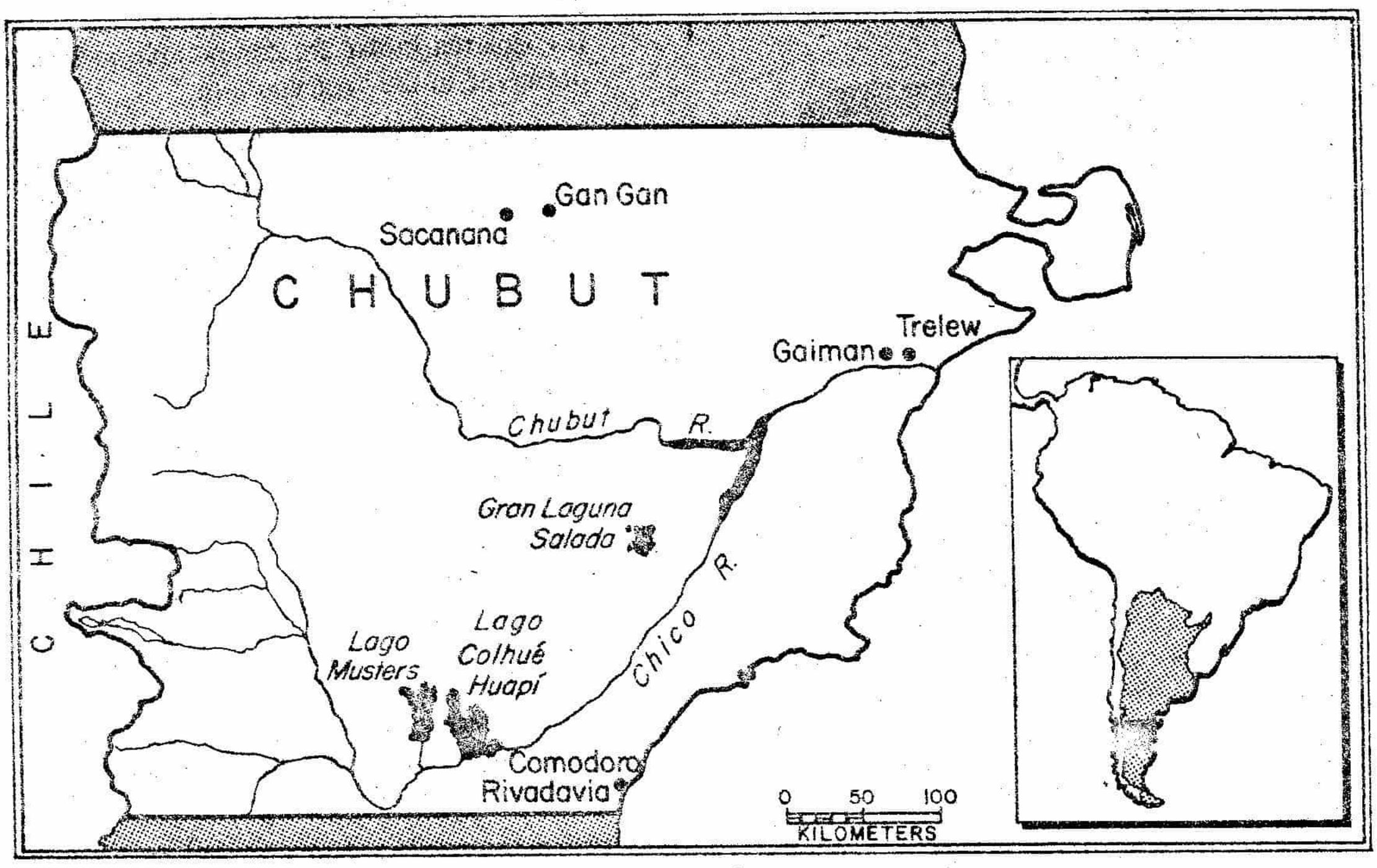

FIG. 2: Map of Chubut, Argentina, showing the location of Gaiman and Sacanana.

DESCRIPTION OF FOSSILS

MACN–CH 354 (Fig. 3,4; Table 1)

This specimen, from Sacanana, is part of a left mandibular ramus preserving M_1, part of P_4, and alveoli for C_1, P_2, P_3, M_2, and the anterior root of M_3. It is suitable is size and overall proportionts to belong with the type specimen of *Tremacebus harringtoni*, the only other primate fossil known from that locality. Pending recovery of additional fossil primates from Sacanana, the mandibular specimen is reasonably attributed to that taxon.

The first lower molar is virtually complete and shows only slight wear. Although they are only slightly worn, the cusps are not very discrete. The are more aptly described as points where two crests join. Compared with the M_1 of most living platyrrhines, that in the fossil has a relatively narrow trigonid that is slightly elevated with respect to the talonid. There is no discrete paraconid; rather, the anterior part of the trigonid is bounded by a continuous series of crests. The talonid is characterized by a well -developed cristid obliqua which constricts it anteriorly. There is no indication of a distinct hypoconulid.

In overall proportions and in the relative development of cusps the first molar in MACN–CH 354 is most similar to the molars of *Homunculus sp.* (Fig. 5) from the Santacrucian localities in Argentina than to the molars of any extant platyrrhine.

Only the buccal half of P_4 is preserved it show that this tooth was partly molarized as in all living platyrrhines, but was relatively narrow compared with the molar width. It was probably very similar to the premolar of *Homunculus sp.* described by Hershkovitz (1981) from Colhuehuapian deposits on the Great Barranca in Southern Chubut.

MACN–CH 356 (Fig 6a; Table i)

This specimen, from Gaiman, is an upper left molar (probably M^2) preserving all of the crown, the roots, and part of the alveolar bone between the roots. It is provisionally attributed to *Dolichocebus gaimanensis*, the only primate previously known from the locality, and is suitable in size to belong to that species (Fig. 7). The tooth crown is only slightly worn and preserves most details of occlusal morphology. In overall shape, the tooth is slightly broader than long and has four main cusps and a prominnent lingual cingulum. The cusps are moderately-well developed, being less tall than those of *Saimiri* and less rounded than those of *Ateles*. There is a small paraconule, but no indication of a metaconule.

In the relative size of the hypocone and the development of the cingulum, the fossil molar is most comparable to the same tooth in *Aotus* or *Saimiri*. In both of these features, in its relative breadth and in the possession of a paraconule, the fossil molar is one of the most primitive teeth known for any platyrrhine. It conforms extramely well with the hypothetical morphotype for a primi-

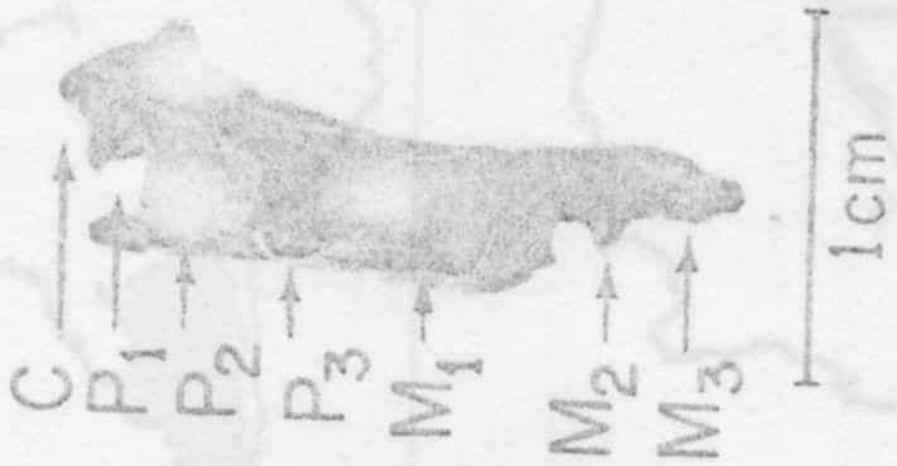

FIG. 3: Stereophotograph of MACH-CH 354, a left mandibular fragment from Sacanana.

tive platyrrhine upper molar as reconstructed by several authorities (Rosenberger, 1979a; Kay, 1980: Fleagle and Bown, 1983.

The tooth has three roots, two buccal and one lingual. The roots show extreme flare from their origin at the base of the crown to their tips: The buccolingual breadth measured across the roots is much greater than that across the crown. The type specimen of *Dolichocebus gaimanensis* from the same locality preserves no teeth, but shows evidence of very broad molar roots (Fig. 7). The roots of the isolated molar are comparable in size to those preserved in the type cranium.

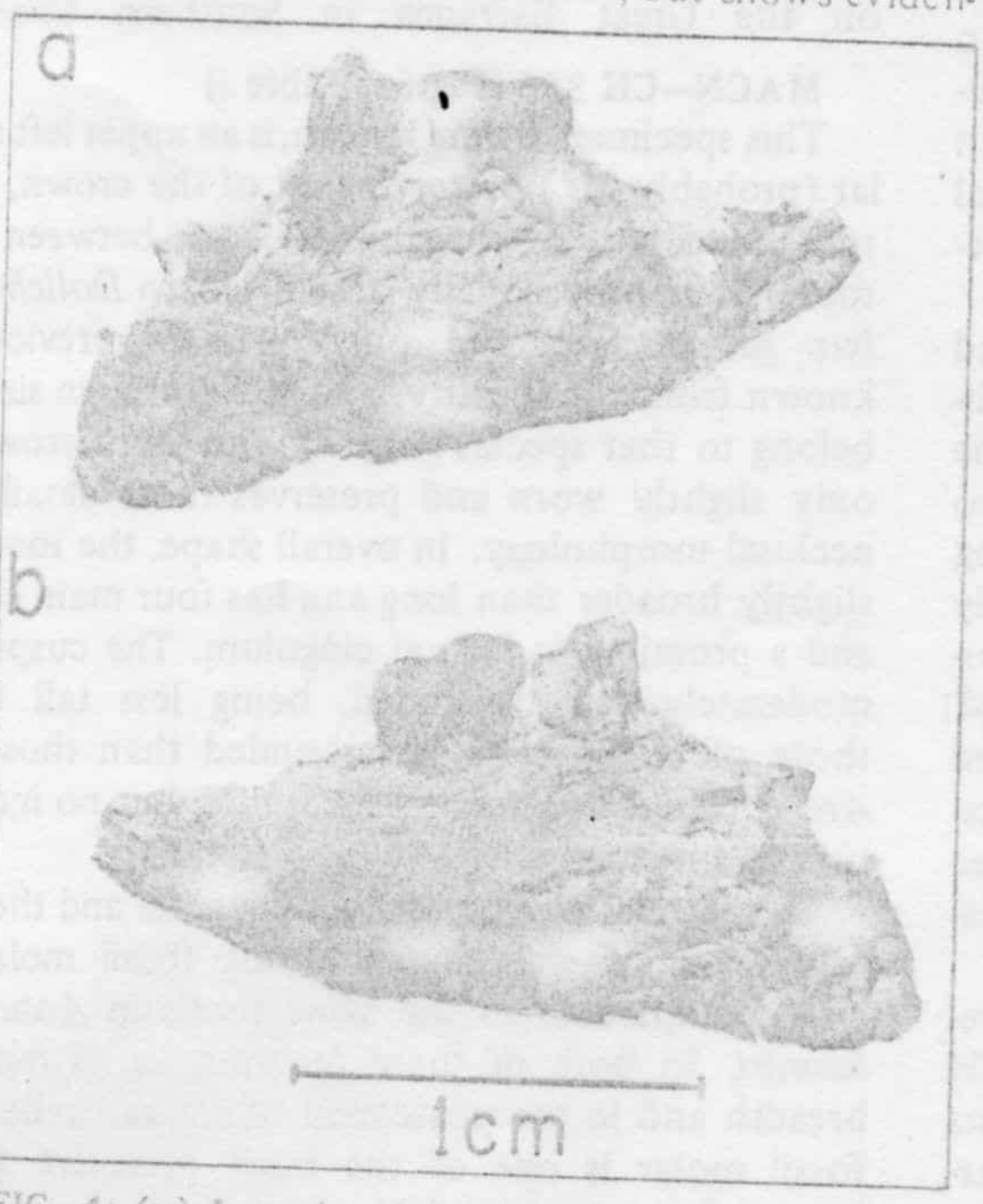

FIG. 4: (a.) Lateral and (b.) medial views of MACN-CH 354.

MACN–CH 358 (Fig 6b).

This specimen, also from Gaiman, is the lingual half of a left M^1 or M^2. On the basis of its very sharp enamel features, the lack of roots, and absence of interdental facets, it is almost certainly an unerupted molar of the same species as the specimen described above.

MACN–CH 357 (Fig 6b; Table 1)

This specimen, from Gaiman, is an upper right last molar (M^3). It lacks an interdental wear facet on the posterior surface and shows the reduced metacone and hypocone characteristic of last upper molars. In overall features such as relative breadth, size and position of the hypocene, development of the cingulum and presence of a small paraconule, and flaring roots, it is similar to the more anterior molar described above (MACN CH 356) and is almost certainly attributable to the same species (Fig. 7).

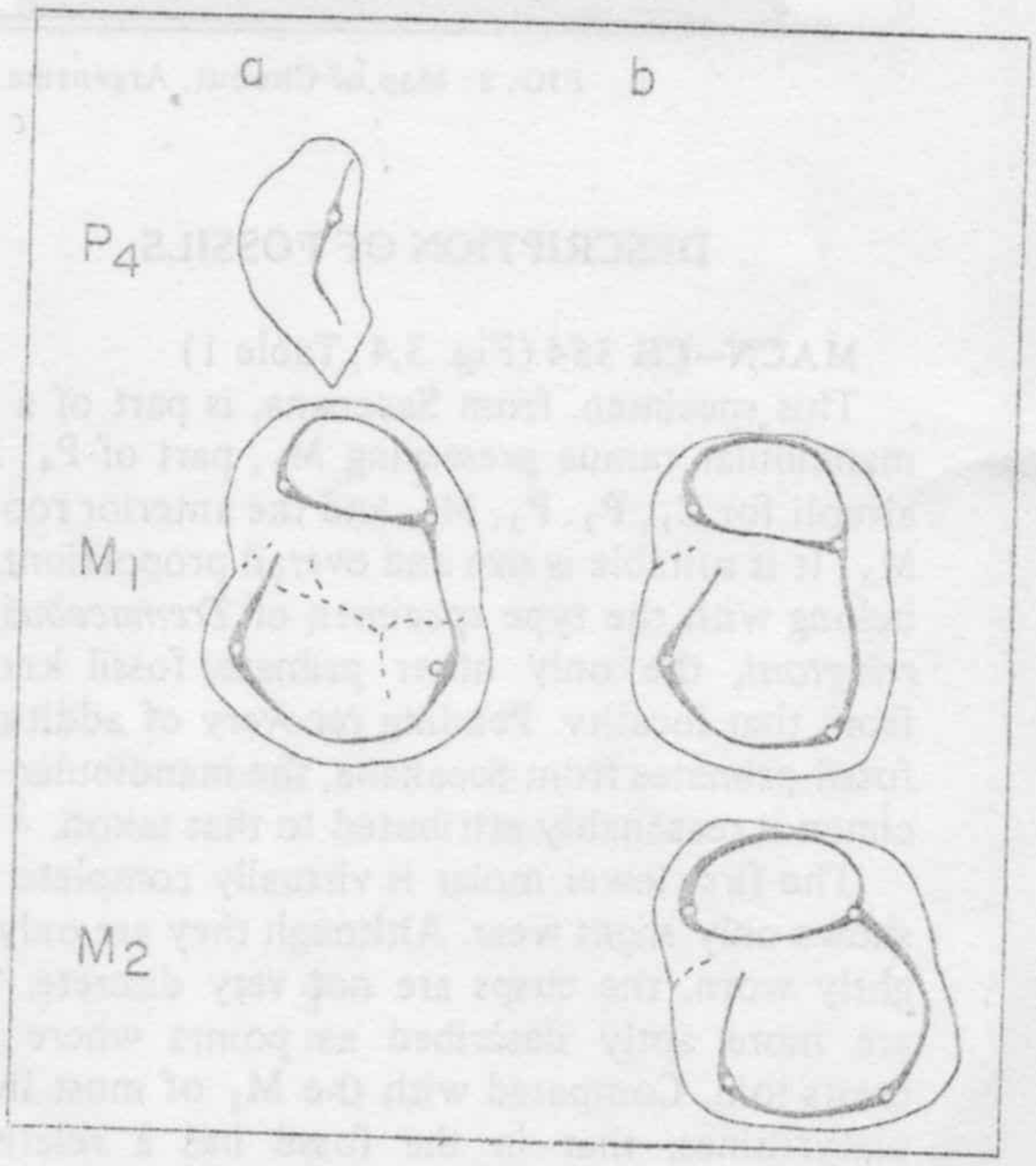

FIG. 5: Comparative drawing of the occlusal morphology of a. cf. *Tremacebus harringtoni* (MACN–CH 354) and b. *Homunculus patagonicus* (based on MACN 10403).

MACN–CH 361 (Fig 8; Table 1)

This specimen, also from Gaiman, is a right upper canine with a complete root. At the base of the crown it is elliptical in cross-section with a longer mesio-distal length than buccolingual breadth. There is a distinct mesial sulcus on the anterior surface of the crown than extends, at a lesser depth, onto the root. Ther buccal surface is smooth and convex; there is a small lingual cingu-

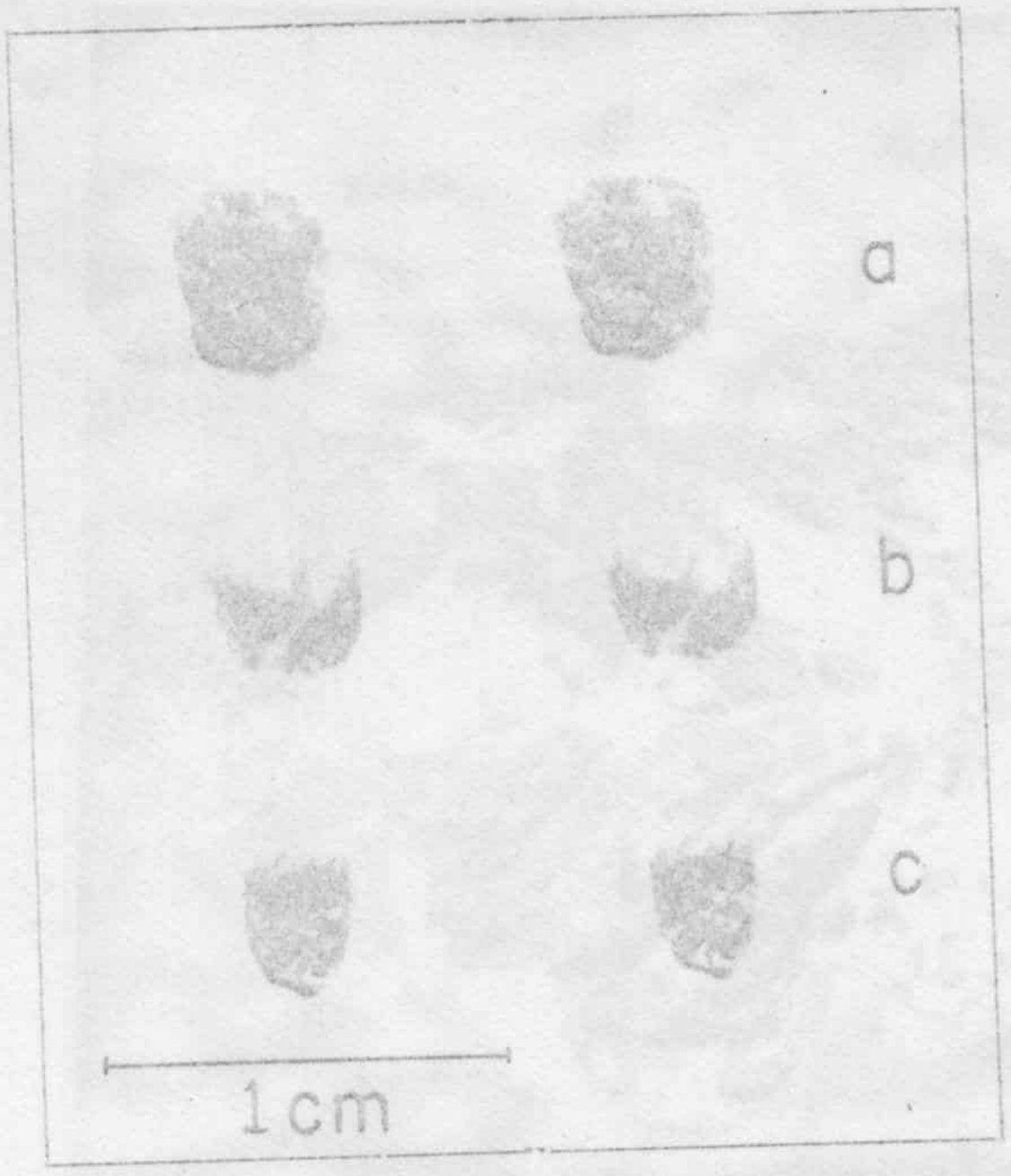

FIG. 6: Sterophotographs of isolated upper molars from Gaiman, attributed to cf. *Dolichocebus gaimanensis*. a. MACN-CH 356: b. MACN–CH 358; and c. MACN–CH 357.

lum. There is a pronounced distal wear facet, (presumably formed by shearing with the anterior lower premolar) and a less distinctive facet on either side of the mesial sulcus (derived from occlusion with the lower canine). This tooth appears to be larger in caliber than the broken base of a canine found in the type skull of *Dolichocebus* (Fig. 7), suggesting the likelihood that these two specimens are from male and female individuals, respectively.

MACN–CH 359 (Fig 8; Table 1)

This specimen. also from Gaiman, is a left upper lateral incisor. The tooth is appropriate in size to belong to *Dolichocebus gaimanensis* and is provisionally assigned to that taxon. It is very heavily worn, but indicates that the upper lateral incisor was relatively broad compared with that of many extant platyrrhines and that it occluded inferiorly with a lower incisor and with the lower canine.

MACN–CH 362 (Fig. 9; Table 2).

The only skeletal element of a primate recovered in 1983 was a left talus from Gaiman. It is from a medium-sized (2-3 kg) monkey and is provisionally assigned to *Dolichocebus*. The bone has a relatively high, narrow trochlea and a long medially-deviated neck. It lacks the characteristic features found in tali of pithecines, atelines or callitrichids and more closely ressembles the talus of medium-sized quadrupedal leapers such as *Saimiri*, *Aotus*, or *Callicebus* (Reeser, 1984).

DISCUSION

In spite of their fragmentary nature, these specimens provide our only good knowledge of the dentition of Colhuehuapian platyrrhines and are among the best dental remains available for any of the Oligocene or early Miocene fossil monkeys from South America. They have a number of implications for our understanding of the origins and early evolution of platyrrhines.

The mandible from Sacanana does not show any features which clearly link it with any one group of extant platyrrhines, but shares a number of feature with the Santacrucian *Homunculus*. If the allocation to *Tremacebus* is correct, this suggests that *Tremacebus* and *Homunculus* may be closely-related taxa as originally indicated by Rusconi (1935). More dental remains of both *Tremacebus* and *Homunculus* are needed to resolve this issue.

The isolated upper teeth from Gaiman, attributed to *Dolichocebus gaimanansis*, do not show striking similarities to the upper dentition of any single extant platyrrhine. The molars are most comparable to those of *Saimiri* and *Aotus* and conform very closely to the hypothetical ancestral platyrrhine as reconstructed from cladistic analysis of extant platyrrhines (Rosenberger, 1979a; Kay, 1980; Fleagle and Bown, 1983). The primitive morphology of the upper dentition attributed to *Dolichocebus* does not uniquivocally corroborate or refute Rosenberger's (1979a; 1982) suggestion that this genus is directly ancestral to the extant squirrel monkey, *Saimiri*, nor is it incompatible with Hershkovitz's (1969; 1982) arguments that *Dolichocebus* is not closely related to any extant platyrrhine. Further cranial evidence is needed to resolve that issue.

More striking than any resemblance to extant platyrrhines is the similarity between the upper dentition of *Dolichocebus* and that of the early catarrhines from the Oligocene of Egypt such as *Aegyptopithecus zeuxis* (Fig. 10; e.g. Simons, 1972; Kay et al., 1981). In the morphology of the upper molars, canine and lateral incisor *Dolichocebus* shares dental features with primitive catarrhines that are unusual among platyrrhines. There are two possible interpretations for these similarities. One is that the Oligocene primates of both Africa and South America have evolved a similar grade of dental evolution. A more likely hypothesis, however, is that the similarities between *Dolichocebus* and *Aegyptopihecus* are characteristics of the last common ancestor of catarrhines and platyrrhines.

New World monkeys first appear in the fossil record in the early Oligocene (Deseadan) and are unquestionable an inmigrant group which must

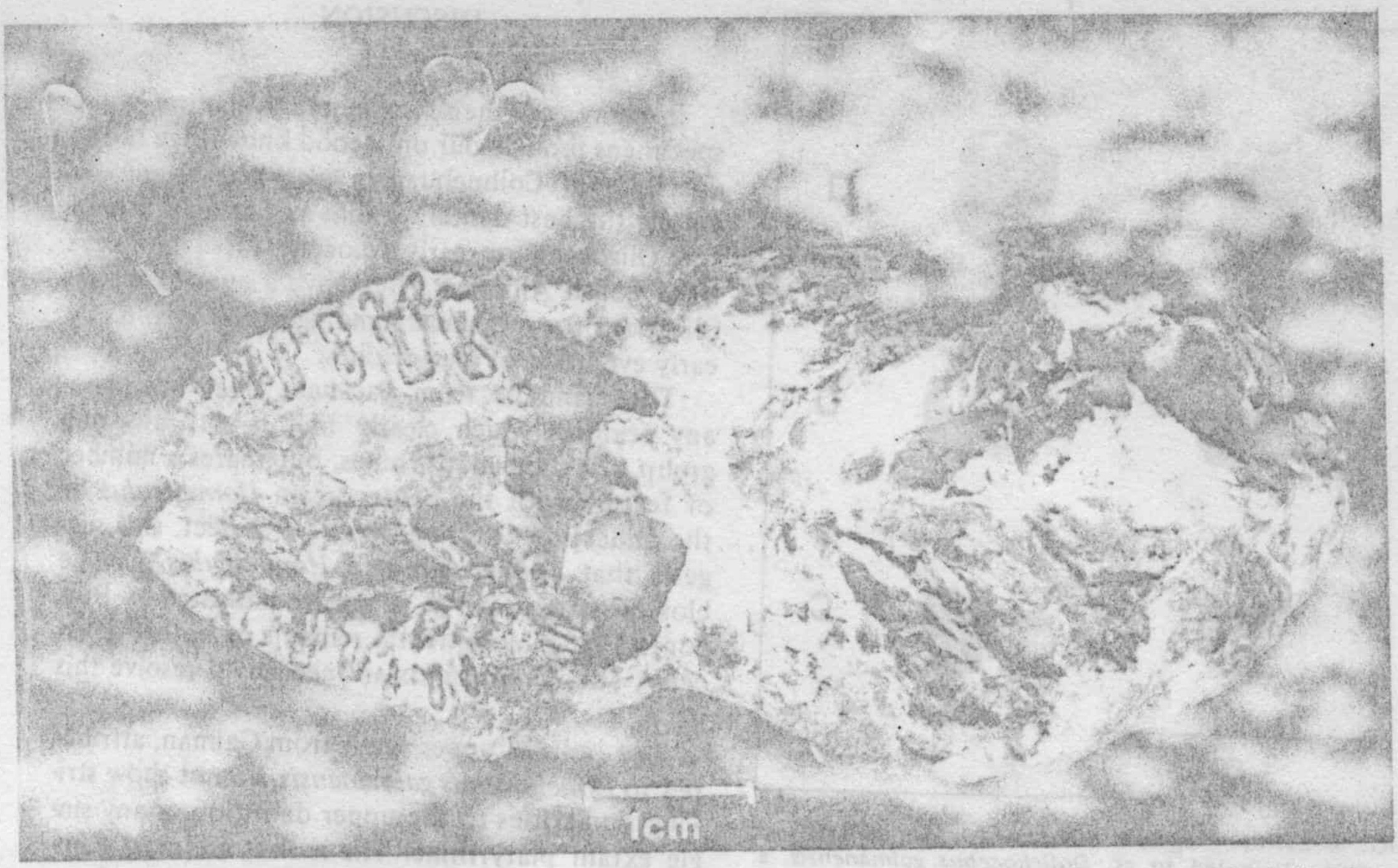

FIG. 7: Inferior view of the type specimen of *Dolichocebus gaimanensis*, from Gaiman, together with the isolated upper teeth from the same locality. All to the same scale.

have arrived on the island continent by rafting. There are currently two main theories concerning their geographic origin. One holds that the earliest platyrrhines (or their prosimian ancestor) rafted from North or Central America. The other main theory suggests that platyrrhine monkeys (and caviamorph rodents) are derived from African stocks which arrived in South America by South Atlantic rafting. The geological evidence does not seem to be particularly convincing for either source as both involve long distance trans-oceanic rafting.

Tarling (e.g. 1982) has argued that possible paleogene land surfaces in the South Atlantic together with more favorable east to west currents would favor an African origin, but others (e.g. Webb, 1979) have argued for relatively short distances between North and South America.

The morphological similarities which unite all anthropoids and the known fossil record of primates in North America and Africa support an African rather than a North American origin for platyrrhines. The absence of any known fossil anthropoids or anthropoid-like prosimians in the Eocene or Oligocene of North America makes a western hemisphere origin for platyrrhines particularly suspicious. On the other hand, there are suitable ancestors for both primitive anthropoids and hystricomorph rodents known from the Early Oligocene of Africa. The dental similarities between the Oligocene platyrrhine *Dolichocebus* and Oligocene catarrhines from Africa are further evidence of morphological affinities between African and South American anthropoid primates. These dental similarities, together with the many postcranial similarities linking Oligocene anthropoids from Africa with New World monkeys provide very strong morphological evidence that the earliest platyrrhine are derived from an African anthropoid stock, rather than from North American prosimians (Hoffstetter, 1972, 1980; Rose and Fleagle, 1981; Fleagle and Bown, 1983.

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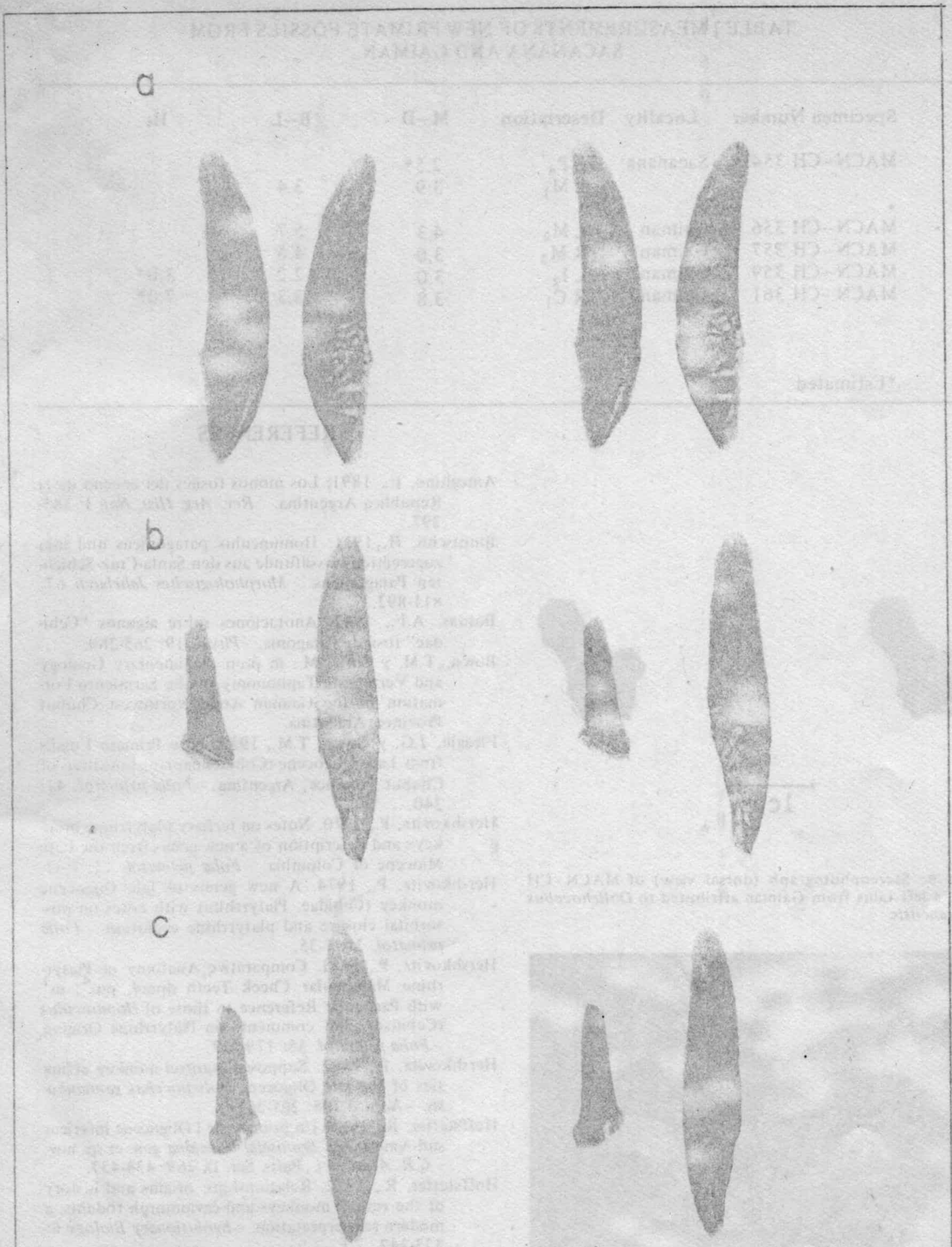

FIG. 8: Stereophotographs of the upper canine and incisor from Gaiman attributed to cf. *Dolichocebus gaimanensis*. a. Buccal and Mesial views of MACN–CH 361; b. posterior views of MACH–CH 359 and MACN–CH 361; c. anterior views of MACN–CH 359 and MACN–CH 361.

TABLE I MEASUREMENTS OF NEW PRIMATE FOSSILS FROM SACANANA AND GAIMAN

Specimen Number	Locality	Description	M–D	B–L	Ht
MACN–CH 354	Sacanana	L P_4	2.5*		
		L M_1	3.9	3.4	
MACN–CH 356	Gaiman	L M_2	4.3	5.7	
MACN–CH 357	Gaiman	R M_3	3.0	4.5	
MACN–CH 359	Gaiman	L I_2	3.0	2.2	3.0*
MACN–CH 361	Gaiman	R C_1	3.8	3.3	7.0*

*Estimated

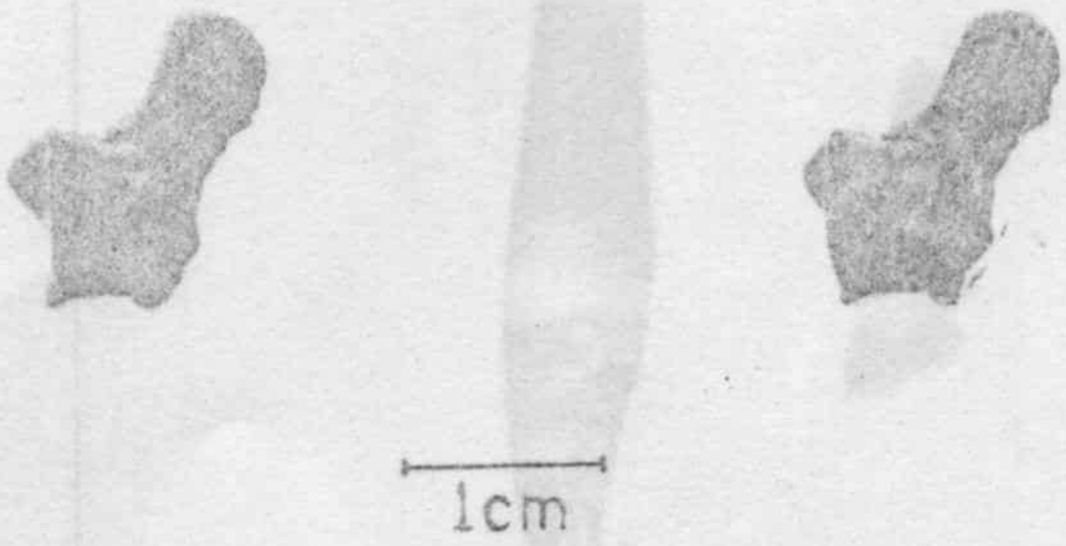

FIG. 9: Stereophotograph (dorsal view) of MACN–CH 362, a left talus from Gaiman attributed to *Dolichocebus gaimanensis*.

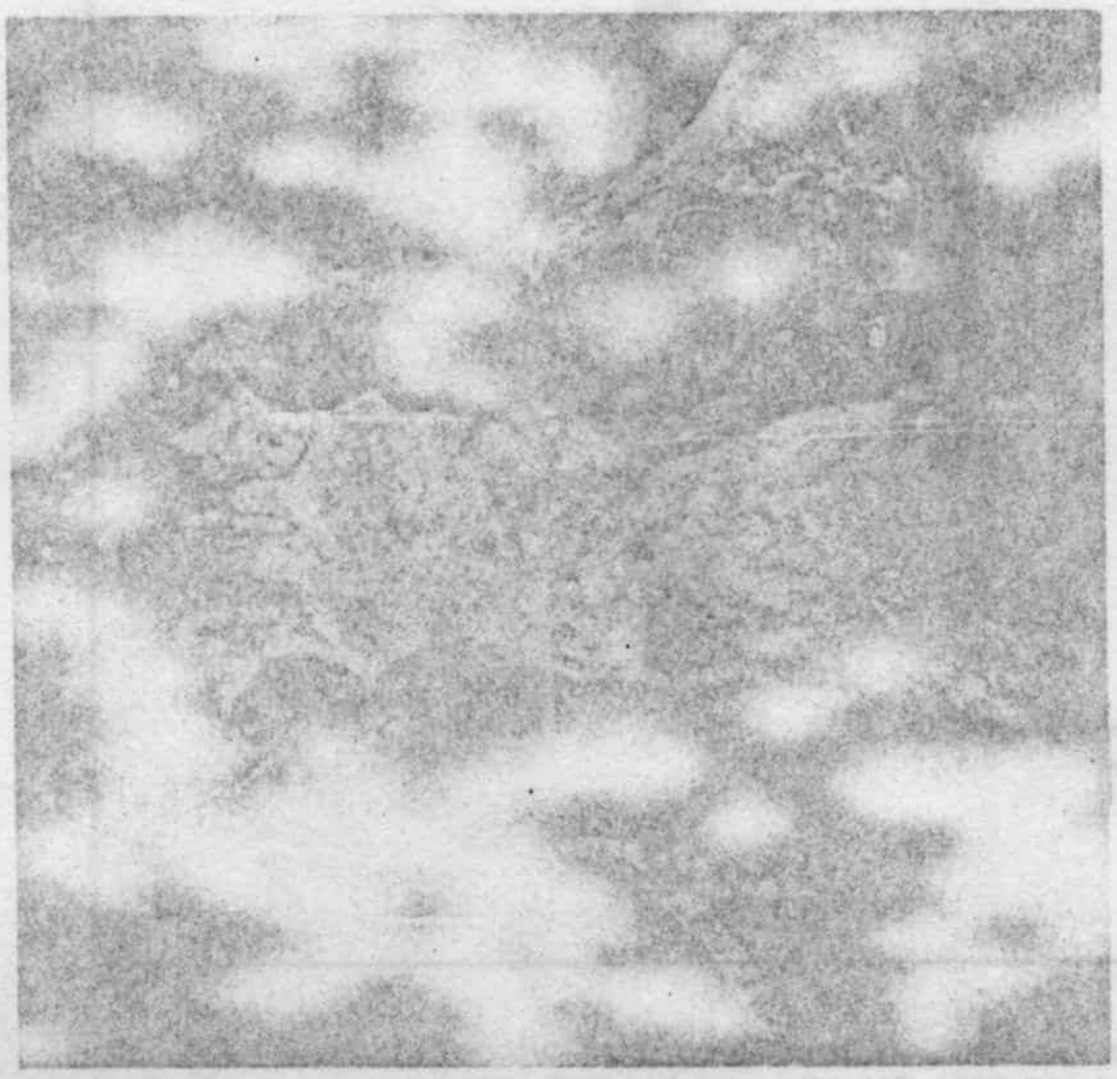

FIG. 10: Occlusal view of the maxilla of *Aegyptopithecus zeuxis* (CGM 40237) from the Oligocene of Egypt.

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